WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2004CT38B

Title: The dual influences of Alewife, Alosa pseudoharengus, on inland water quality: nutrient fluxes and food web effects

Project Type: Research

Focus Categories: Water Quality, Nutrients, Ecology

Keywords: river herring, alewife, nutrients, food webs, zooplankton, anadromous, landlocked, phytoplankton

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Non-Federal Matching Funds: $56,698

Congressional District: 3

Principal Investigator:
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Abstract

Across North America dams are being removed and fish ladders installed, allowing migratory fish species access to inland waters that have been isolated, in many cases, for a century or more. This is an experiment of unprecedented scope and scale, with implications for ecological processes ranging from species conservation to water quality management. In coastal systems, such as those found along the Atlantic seaboard, anadromous fishes are the focus of considerable attention. While species such as the Atlantic salmon have garnered the preponderance of attention, ecological interactions and water quality may be most strongly influenced by less glamorous, but historically more abundant fishes such as alewife, Alosa pseudoharengus. Of particular interest are the influences of restoring anadromous alewives to lakes and ponds where no pelagic zooplanktivore currently exists, and the restoration of anadromous alewives into lakes and ponds where landlocked populations of alewives currently reside. I seek funding to continue my research on the influence of river herring restoration efforts on the water quality and ecological function of inland water in Connecticut and throughout New England. Objectives: The long-term objectives of this research are to test 1) the

ecological and evolutionary implications of the shift from an anadromous to an entirely freshwater lifestyle, including shifts in the relative roles of young-of-the-year anadromous and landlocked alewives on food web structure and water quality, and 2) to quantify the role of anadromous alewives as nutrient vectors. Approach: I will use experimental food web manipulations in mesocosms to evaluate differences in food web impacts of landlocked and anadromous alewives in their first summer of life. Nutrient excretion experiments and modeling will be used to evaluate the role of anadromous alewives as nutrient vectors. Molecular genetic approaches will be employed to evaluate the origin and potential for rapid life history shifts from anadromy to an entirely landlocked life history. Results from year one: In the spring and summer of 2004, I (1) developed methods for rearing larval anadromous and landlocked alewives for our experimental research, (2) tested for differences in the effects of anadromous and landlocked alewives in their first summer of life on water quality in Rogers Lake, (3) collected much of the data required to develop a general model of nutrient loading by anadromous alewives, (4) started collecting the landlocked and anadromous alewife samples required to evaluate the evolutionary origin of landlocked populations of alewives as a first step in attempting to understand the outcome of secondary contact between anadromous and landlocked alewife populations, and (5) started monitoring Linsley Pond, Rogers Lake and two reference lakes to gather pre-manipulation data on Linsley and Rogers before fish ladders are installed and anadromous alewives recover into these two lakes. Expected results for year two: In the second year of this study I will focus on (1) repeating the experimental test for differences in the effects of anadromous and landlocked alewives in their first summer of life on water quality in Rogers Lake, and expanding that experiment to Linsley Pond where, unlike in Rogers Lake, there is no existing population of landlocked alewives, (2) estimating the functional form of the most important parameters required to model nutrient loading by anadromous alewives, (3) finishing our molecular analysis of alewife populations, and (4) continue monitoring Rogers Lake, Linsley Pond, and two regional reference lakes (Pattaganset and Quonnipaug). These results will address a number of the most pressing research needs by the CT DEP inland water management group, and lay the groundwork for future studies on competition between anadromous and landlocked alewives and the long-term effects of alewife restoration on lake ecosystem processes including water quality.